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DIV. OF OIL, GAS & MINING

**Supplemental Information for the
Alluvial Valley Floor
Investigation at the
North Private Lease Area**

**Alton Coal Development, LLC
Coal Hollow Mine**

October 10, 2014

On July 17, 2014 Alton Coal Development, LLC (ACD) submitted a report to the Utah Division of Oil, Gas and Mining (Division) entitled *Alluvial Valley Floor Report on the North Private Lease Area*. This report presented the findings of a field investigation that included geologic, hydrologic, land use, soils, and vegetation studies in the proposed North Private Lease permit and adjacent area as required by R645-302-321.100. The Division evaluated the report and subsequently prepared a Technical Memorandum dated September 16, 2014 in which additional information was requested (see Summary, Task #4641).

The additional information requested by the Division in the September 16, 2014 Technical Memorandum is presented in this document. In the following sections of this document, each of the Division's information requests are stated in bold, followed by ACD's response. A Photographs Section is included at the end of this document. ACD will respond to the additional miscellaneous issues discussed in the Division's Technical Analysis (but not included in the document summary) in the MRP submittal for the North Private Lease Area as necessary.

Division Request:

R645-302-321.322 - Based on Hydrology Map 7, irrigation water is allocated to some lands just south of the farm road, and north of the elk fence. Currently, there are fields in this area that are irrigated using hand lines as outlined in Soils Map 5. Please provide further information that would demonstrate why these lands (currently irrigated lands south of the farm road and north of the elk fence) do not have the capability of being flood irrigated.

ACD Response:

Based on information in government documents (Hydrographic Map 1A) and statements from land owners (Appendix A – AVF Information), it is apparent that these areas have not historically been flood irrigated. The lack of historic flood irrigation of these lands (while adjacent lands to the north were being flood irrigated) provides support to the conclusion that flood irrigation of these lands was not an economically favorable agricultural practice.

There are several likely reasons for the lack of flood irrigation in these areas. These may include the following:

- There is insufficient water to flood irrigate additional acreage. The available water has been used to flood irrigate the most favorable lands which are located to the north (i.e. there is not sufficient water for flood irrigation or subirrigation activities in these lands).
- There is rolling topography in the area that is not favorable for flood irrigation. The topography of the lands to the north is more favorable.
- Due to the incision of the stream drainages, aggressive erosion of the soft alluvial sediments underlying these lands is currently taking place (see Photographs Section of this document). This is most apparent south of the elk fence, but the erosion appears to be moving up the drainage toward areas to the north. The downcutting and headword erosion in the washes has created isolated plateaus surrounded by steep erosional escarpments that are highly susceptible to additional soil erosion. The presence of flood irrigation water streams on the tops of these plateaus/terraces would likely exacerbate the potential for erosion of the plateau surfaces, especially where irrigation runoff/return flows were to flow over the plateau escarpments into the incised surface-water drainages. Control of erosion has been and continues to be a major issue in the greater Alton Amphitheater area (see Photographs Section). Flood irrigation of lands susceptible to erosion compounds this concern. Conversion to sprinkler irrigation systems reduces the soil erosion hazard.

Division Request:

R645-302-321.200 - The high and low water depths, as labeled on Hydrology Map 3 do not correspond with depths measured with the piezometers in Table B-2a, please address this discrepancy.

ACD Response:

The difference in water level depths between Table B-2a and Hydrology Map 3 are due to two factors.

- The piezometer water level depths were adjusted to ground level in order to directly compare them with plant rooting depths, and soil mottles on Hydrology Map 3 and in Figure 2. Piezometer well elevations in Table B-1 were surveyed at the top of the well casing. Plant rooting depths and soil mottle depths were measured from the ground surface. Adjustments for the "Stick-up" height of the well casing above the ground surface vary from 0.2 to 0.5 feet (Table B-3).
- Hydrology Map 3 was initially prepared in early June 2014 prior to ACD's power point presentation of the AVF data to Utah DOGM staff on June 19, 2014 in Price, Utah. Second quarter water level measurements were collected for the piezometer wells on June 18, 2014. Second quarter well data was incorporated into Table B-2a, but not into Hydrology Map 3 or Figure 2. The results of including the June 18, 2014 well data are shown in the following table.

In summary, including the second quarter (June 18, 2014) water level data raises the *High* water level at one location (2.0 feet at NLP-1), no changes at four locations (NLP-2, NLP-3, NLP-8, and NLP-11), and lowers the *Low* water level at seven locations from 0.1 to 0.5 feet or more (NLP-4, NLP-5, NLP-6, NLP-7, NLP-9, NLP-10, and NLP-12).

Table 1. Supplemental water levels for Hydrology Map 3. These water levels include the well data collected on June 18, 2014.

Piezometer Well	High Water Level	Low Water Level	Adjustment for Height of Well above Ground ¹	Remarks
	feet	feet	feet	
NLP-1	11.4	14.8	0.3	High water level raised from 13.4 to 11.4 feet.
NLP-2	14.6	15.9	0.3	No changes.
NLP-3	27.6	28.0	0.3	No changes.
NLP-4	3.1	4.0	0.5	Low water level dropped from 3.8 to 4.0 feet.
NLP-5	5.0	6.9	0.5	Low water level dropped from 6.7 to 6.9 feet.
NLP-6	16.7	17.6	0.2	Low water level dropped from 17.5 to 17.6 feet.
NLP-7	19.2	22.4	0.5	Low water level dropped from 21.9 to 22.4 feet.
NLP-8	12.9	14.8	0.2	No changes.
NLP-9	20.4	>24.0	0.5	Low water level dropped from 22.6 to > 24.0 feet.
NLP-10	23.6	23.9	0.3	Low water level dropped from 23.7 to 23.9 feet.
NLP-11	>29	>29	0.3	No changes.
NLP-12	16.2*	17.0	0.5	Low water level dropped from 16.9 to 17.0 feet.
<ol style="list-style-type: none"> 1. "Adjustment for Height of Well above Ground" listed as "Stick-up" in table B-3. 2. High water level corrected for "Adjustment of "Height of Well above Ground" listed as "Stick-up" in table B-3. 				

Division Request:

R645-302-321.200 - Water data is provided for NLP-13 in Tables B-2a and B-2b, but this well doesn't appear on Figure 2 of page 22 of the report, Hydrology Map 3, or in Tables B-1 and B-2. Please correct this discrepancy or provide explanation as to why this well has been excluded.

ACD Response:

The water data in Tables B-2a and B-2b includes information for NLP-13. This information is provided for regional water quantity and water quality characterizations. However, well NLP-13 is located outside of the alluvial valley floor evaluation area and is therefore not included in the other figures and tables which are specific to the potential alluvial valley floor evaluation area. NLP-13 is separated from the Kanab Creek study area by a thick, topographically elevated sequence of low-permeability Tropic Shale bedrock.

Division Request:

R645-302-321.260 - Page 9 paragraph 5, the pastures within and adjacent to Kanab creek in the lease appear to be used for grazing at least from the 9/3/2014 site visit. The text in this paragraph should be clarified based on the 9/3/2014 site visit and personal communication with the landowner or individuals responsible for grazing in the area.

ACD Response:

Our observations have been that the incised drainage along Kanab Creek is not extensively used for grazing. Livestock watering is the primary use of this area. Even the amount of use for livestock watering is dependent on the individual landowner. The majority of the area along Kanab Creek had very little evidence of livestock use, if any, during our visits.

Intensive use of the narrow incised drainages for grazing would quickly reduce or eliminate the amount of vegetative cover and result in accelerated soil erosion.

Division Request:

Page 9 paragraph 5, 2nd italicized paragraph, it appears as though this excerpt from the OSM guidelines (1983) was included in the application under the assumption that there was a "consensus". The applicant needs to clarify this statement by providing documentation that supports this assumption.

ACD Response:

We have observed agricultural operations near Alton, Utah and in the surrounding regions since 2005. It has not been our experience that the narrow channel bottoms have been extensively used for crop production or grazing operations (although stock watering along the streams occurs). Agricultural production and stock grazing occurs primarily on the elevated terraces above the narrow-bottomed channel bottoms.

The term "consensus" in the 2nd italicized paragraph was included as part of the OSM excerpt for informational purposes only.

Division Request:

Some of the land just south of the farm road is not capable of flood irrigation, mainly due to topography, but small portions of it appear to be capable of flood irrigated through the existing irrigation company's diversion system. The Permittee must provide additional information as to why they have excluded these areas as potential AVF.

ACD Response:

Based on information in government documents (Hydrographic Map 1A) and statements from land owners (Appendix A – AVF Information), it is apparent that these areas have not historically been flood irrigated. The lack of historic flood irrigation of these lands (while adjacent lands to the north were being flood irrigated) provides support to the conclusion that flood irrigation of these lands was not an economically favorable agricultural practice.

There are several likely reasons for the lack of flood irrigation in these areas. These may include the following:

- There is insufficient water to flood irrigate additional acreage. The available water has been used to flood irrigate the most favorable lands which are located to the north (i.e. there is not sufficient water for flood irrigation or subirrigation activities in these lands).
- There is rolling topography in the area that is not favorable for flood irrigation. The topography of the lands to the north is more favorable.
- Due to the incision of the stream drainages, aggressive erosion of the soft alluvial sediments underlying these lands is currently taking place (see Photographs Section of this document). This is most apparent south of the elk fence, but the erosion appears to be moving up the drainage toward areas to the north. The downcutting and headword erosion in the washes has created isolated plateaus surrounded by steep erosional escarpments that are highly susceptible to additional soil erosion. The presence of flood irrigation water streams on the tops of these plateaus/terraces would likely exacerbate the potential for erosion of the plateau surfaces, especially where irrigation runoff/return flows were to flow over the plateau escarpments into the incised surface-water drainages. Control of erosion has been and continues to be a major issue in the greater Alton Amphitheater area (see Photographs Section). Flood irrigation of lands susceptible to erosion compounds this concern. Conversion to sprinkler irrigation systems reduces the soil erosion hazard.

Division Request:

Additional information will need to be submitted during any permitting action which would characterize the coal seam and the relative depths of coal and overburden. A Geologic cross section through the valley is needed.

ACD Response:

ACD will provide information to characterize the coal seam and the relative depths of coal and overburden. This information will be provided as part of the MRP submittal for the North Lease. Geologic cross-sections through the valley will be provided.

Photographs Section



Photograph 1

Fields of North Private Lease Area. Note deeply incised channels and isolated plateaus/terraces with steep erosional escarpments in soft sediments.



Photograph 2

Fields of North Private Lease Area adjacent to Kanab Creek. Note plateau/terrace topography and erosion along margins of field.



Photograph 3

Sloping hillside on east side of Kanab Creek. Note the excavated ditch/trench. Landowner (C. Heaton, 2014) indicates that this trench was dug to prevent erosion of fields below from surface-water runoff over escarpment plateau/terrace topography. Mr. Heaton indicated that most of the ditch-like structures in the area are for erosion control.



Photograph 4

The terminus of the trench/ditch structures shown in Figure 3. Note the extensive erosion and the landowner attempts to prevent upward migration of the erosional scour by placing all manner of rip-rap at the erosional face.



Photograph 5

Headward erosion and landowners attempts to stop the upward progress of the erosion in the North Private Lease Area.



Photograph 6

Outlet from stock watering pond immediately south of elk fence along western margin of North Private Lease Area (Photo from May 2008). Note extreme erosion of soft sediments below the pond outlet. Subsequently, this pond/dam was washed out around February 2012.